

STATEMENT OF WORK

1.0 Overview of Project

The Washington Metropolitan Area Transit Authority (WMATA) plans to procure Bus CCTV Systems for all or a portion of their transit vehicle fleet. This procurement will take place in a phased timeframe based on the availability of funds. WMATA currently has funding for the first phase (minimum of the Base System) of this project. The WMATA Bus CCTV “Base System” shall include a minimum of at least 200 Transit Buses, 50 Supervisor / Police Vehicles, and a Back Office Subsystem to support this initial Base System. Phase 1 is to be completed no later than December 31, 2009.

The purpose of the Bus CCTV System will be to act as a deterrent against illegal or improper behavior on-board the bus (such as vandalism, theft, assault, etc.), and to provide an investigative tool in the case of the occurrence of any of the aforementioned activities as well as incidents such as injury claims, accident claims, and general customer complaints.

The Bus CCTV System shall monitor and record video, audio and selected auxiliary equipment onboard the transit vehicles. The system shall include all hardware, software, and cable necessary for the successful installation of Bus CCTV systems in accordance with this specification; including but not limited to all Digital Video Recorders (DVRs), cameras, microphones, Global Positioning System (GPS) information, 802.11 onboard wireless and other onboard components. The system shall include all fixed-end software specified in this Statement Of Work (SOW), as well as the installation of this software on WMATA designated workstations and servers. Contractors shall ensure that all software functions as designed on the WMATA provided fixed end hardware as outlined in this SOW. The Bus CCTV system shall also include all hardware, software, and cable necessary for the successful installation and implementation of a real-time video surveillance and upload capability on WMATA Supervisor and Police vehicles. Finally, the Bus CCTV System shall include all installation, testing, documentation, training, warranty, maintenance and support as outlined in this SOW. It is the intent of WMATA to secure a system that is configured for WMATA’s needs in accordance with the specifications set forth in this SOW.

All work for this project shall take place at WMATA’s facilities under the Terms and Conditions spelled out in this RFP.

2.0 Base Scope of Services

The Contractor shall perform all work detailed in this RFP, unless otherwise specified. The scope of work to be performed includes furnishing all materials, tools, equipment, transportation, supervision and performing all labor and services necessary and incidental to designing, installing, testing and maintaining the Bus CCTV System in accordance with Contract requirements. The Contractor’s work includes, but is not limited to, the following:

- A. Performing a complete installation of specified systems, subsystems, and components, including engineering interface with new equipment. In the subsequent phase of the contract where possible removal of existing CCTV equipment is necessary, the removal and any old CCTV equipment shall be returned to WMATA. Unless otherwise noted, this

- shall include the provision of all new or replacement components, consumables, disposables, and standard hardware by the Contractor, as necessary to complete the installation.
- B. Performing detailed design for the system whole and in part related to equipment, engineering, manufacturing, and testing of system.
 - C. Providing technical data, software, samples, and mock-ups for new items, as required.
 - D. Performing qualification and acceptance testing.
 - E. Providing training programs to the Authorities' operations and maintenance staff in the usage and maintenance of all new systems.
 - F. Executing the preparation and configuration control of as-built drawings, material and process specifications, and all other engineering, design and manufacturing information required to present the final as-built design of the work as developed and approved. Providing vehicle configuration verification and drawing conversion as specified.
 - G. Providing the Illustrated Parts Catalog and maintenance manual in a suitable electronic format to be used for updating the WMATA's existing Maximo Maintenance Reporting System.
 - H. Updating maintenance and operational manuals and delivering completed inserts for manuals, parts lists, tool lists, and special tools lists, in the numbers specified.
 - I. Providing special tools and diagnostic test equipment for new and upgraded systems.
 - J. Delivering spare parts as specified. Administering warranty and Maintenance programs.
 - K. Supporting WMATA's Safety Certification Program.

Vehicles Out of Service

The Contractor shall be limited by a not-to-exceed of eight (8) vehicles removed from WMATA service at any one time during the Contract; and the Contractor shall plan work according to this restriction. The not-to-exceed of eight (8) vehicle limit includes vehicles that are not available for revenue service due to Contractor activities such as qualification testing, acceptance testing, and equipment retrofits. WMATA reserves the right to change this number of vehicles as their operations require.

WMATA-Furnished Facilities and Equipment

WMATA will make available to the Contractor certain facilities and equipment at WMATA bus divisions shop and yard for support of acceptance testing and warranty. Specifically WMATA will provide the Contractor with the following:

WMATA Facilities

WMATA will provide the following facilities depending on the division's location:

- A. Access to one parking location to install, inspect, test, and prepare bus CCTV system for delivery completion.
- B. Parking space, as available, sufficient for one bus as coordinated with WMATA's Bus Maintenance department.
- C. Access on yard space for acceptance testing during limited nighttime and weekend hours.
- D. Facilities for training.

Other than as stated above, availability is not warranted or guaranteed as to when the facilities or yard time and space will actually be available.

COOPERATION WITH OTHER CONTRACTORS AND INTERFACES

The Authority may at any time perform, or cause to be performed by other Contractors, work related to the Work under this Contract.

Cooperation

The Contractor shall cooperate with such other contractors and shall conduct the operations in such a manner as not to cause any unnecessary delay or hindrance to the other contractor's work. The Contractor shall adjust and coordinate the work with theirs so as to permit proper and timely completion of all work.

Interfaces

When any contractor or subcontractor performing work under or pursuant to another Authority contract is employed on work that interfaces with the work under this Contract, the Contractor, at their expense, shall provide to the Authority all necessary drawings, dimensions, data, software code, and other information, pertaining to new and upgraded equipment, necessary to ensure the complete, integrated, and proper design, manufacture, installation, and operation of all interfacing and connecting parts or systems.

The exchange of information will be coordinated by the Authority and the Contractor and copies of all the Contractor's data, drawings and correspondence relating to the above for interchange among contractors shall be furnished in sufficient quantity as requested by the Authority.

Joint Use of Facilities

When the Contractor and any other contractors are employed on related work at the Authority's facilities, or are using the same storage areas or access routes, the Contractor shall be responsible for any damage or loss caused to the other by its action.

Bus CCTV System and Bus Division Access Point (AP) Interface Information

If needed, and upon reasonable notice, the Contractor shall attend meetings with the Authority and other contractors in order to establish the proper Bus CCTV System compatibility and shop equipment interfaces throughout the term of this Contract. If the Contractor is able to demonstrate compatibility, attendance at interface meetings shall not be required. As needed, the Contractor shall provide technical data related to Bus CCTV System compatibility and AP equipment interface information.

- I. **Technical Data Sheets** – The Contractor shall provide a copy of technical data sheets for each and every component being provided by Contractor on this project.
- II. **Sample Video** – The Contractor shall provide a DVD or CD of sample video segments from a 5 Bus CCTV installation at frame rates and resolutions that closely match the specifications found in the Statement of Work. The sample video segments shall total approximately 15 minutes, and shall include segments from both daytime and night-time operation. The sample video shall preferably be in a format that does not require any special software installation. If software installation is required, the proposal shall include such installation instructions. In this section of the proposal, the Contractor shall describe the source and settings of this sample video including:

- A. Transit agency or agencies where sample video originated
- B. Camera number, frame rate, resolution settings for each camera
- C. Audio setting
- D. Metadata (WMATA prefers clips with some form of metadata on them)

3.0 Background and Current Environment

The WMATA Bus CCTV System project shall include 3 major subsystems:

1. Transit Vehicle Onboard Subsystem
2. Supervisor / Metro Police Vehicle Onboard Subsystem
3. Back Office Subsystem

Transit Vehicle Onboard Subsystem

The Transit Vehicle Onboard Subsystem will include all CCTV hardware and software to be installed on the WMATA Transit Buses. WMATA currently has a total of 1475 active Transit Buses. A total of 737 of the above buses are currently equipped with some form of an onboard Bus CCTV system. This includes the following:

- 475 buses with Safety Vision RoadRecorder 6000 DVRs, cameras and auxiliary equipment
- 117 buses with GE MobileView 3 DVRs, cameras and auxiliary equipment
- 145 buses with GE MobileView 4 DVRs, cameras and auxiliary equipment

The purpose of the Transit Vehicle Onboard Subsystem is to record all video, audio, event and metadata information onto a Digital Video Recorder (DVR) on the Transit Vehicle for subsequent use by the WMATA Safety and Police personnel.

Supervisor / Metro Police Vehicle Onboard Subsystem

The Supervisor / Metro Police Vehicle Onboard Subsystem will include all hardware and software to be installed on the WMATA Supervisor / Metro Police vehicles. The purpose of this subsystem will be to view and/or download selected video, audio, event, metadata (during an emergency) over an 802.11 wireless link whenever the Supervisor / Police vehicle is in range of a Transit Vehicle.

Back Office Subsystem

The Back Office Subsystem will include all hardware and software required for Bus CCTV System back office operations. These include all non-vehicle based workstations, laptops, servers, and wireless hardware, as well as the system and application software that runs on that hardware. Included in the Back Office Subsystem will be the 802.11 WLAN infrastructure in the divisions (bus yards). WMATA has nine (9) bus divisions. Currently four (4) of the nine (9) divisions have 802.11g/n wireless Access Points (AP) installed in them. WMATA will be responsible for all workstations, servers and network hardware (including 802.11 WLAN APs at the division) installed as part of the Back Office. The Contractor will be responsible for application software that runs on this hardware.

Phase Implementation

The WMATA Bus CCTV project will be performed in phases based on the availability of funds. The WMATA Bus CCTV “Base System” shall include a minimum of at least 200 Transit Buses, 50 Supervisor / Police Vehicles, and a Back Office Subsystem to support this initial Base System. Detailed quantities for the Base System purchase are shown in the Price Sheets. WMATA currently has sufficient funding for at least this “Base System” procurement. The “Base System” procurement will be done on 200 buses that do not currently have any existing CCTV systems onboard and be completed no later than December 31, 2009.

Future phases of the project will allow WMATA to procure additional Bus CCTV “Optional Systems” as additional funding becomes available. The number of Transit Buses and Supervisor / Police Vehicles included in each phase will be solely determined by the available funding and the pricing from the selected Contractor. The schedule for Phase 2 and beyond is uncertain at this time, and WMATA reserves the right to stop after Phase 1 or after any subsequent phase.

All equipment proposed shall conform to the specifications in this SOW. Any proposed equipment that does not conform should be noted in the Contractor’s proposal response.

4.0 Transit Vehicle On-Board Subsystem

This section provides detailed specifications for the Transit Vehicle On-Board Subsystem. All equipment provided for the transit vehicle shall be new, not used. Contractor will be responsible for removal and disposal of any existing Bus CCTV equipment (as well as costs associated with that removal and disposal) for all buses that currently have Bus CCTV equipment installed. Two configurations of bus equipment are referenced throughout this specification. They are:

- Five (5) Camera Bus Configuration: These are the 26’-42’ buses. They encompass all of the buses that will be installed in Phase 1, and the vast majority of buses to be installed in future phases.
- Nine (9) Camera Bus Configuration: These are the articulated buses. There are currently 79 articulated buses in the fleet. Twenty-two (22) of these articulated buses currently are installed with GE CCTV equipment.

All equipment proposed for these two solutions shall be compatible. This includes, but is not limited to:

- Compatibility of removable disk drive solution such that a disk drive can be removed from a five camera bus, and subsequently used in a nine camera bus; and vice-versa.
- Compatibility of software (both on the DVR and in the Back Office) such that the same software and firmware is resident on both the five camera DVR and nine camera DVR, and the same video review and other Back Office software is used for both solutions.

Throughout this SOW, those places where requirements differ between the five camera and nine camera bus solution will be marked with the tag “Five (5) camera bus solution” or “Nine (9) camera bus solution” respectively. All other requirements shall be applicable to both solutions.

The specifications for the Transit Vehicle On-Board Subsystem are included in the following subsections:

4.1 Digital Video Recorder

Each bus shall have one (1) Digital Video Recorder (DVR) device installed. This DVR shall have the following capabilities:

- i. All buses shall be installed with the same make/model DVR. (NOTE: The only potential exception to this requirement is in the case where the Contractor has multiple DVR models from the same “family” of DVRs, and there is a cost benefit for using one DVR model for the five camera bus solution and a different model – from the same family of equipment – for the nine camera bus solution. However, if this option is chosen, the Contractor shall still meet the requirements for total compatibility between these systems.)
- ii. The DVR shall be designed specifically for installation in the transit bus environment.
- iii. The DVR shall be capable of recording multiple video, audio, metadata and event inputs simultaneously on a removable shock-resistant disk drive.
- iv. The DVR shall utilize a secure video compression methodology. Contractor shall state in proposal the specific type of compression used in the DVR, and the watermarking methodology or equivalent that ensures the security of the video and related data. Methodology for capture, storage, and transfer of the video and related data shall be enforceable in a court of law.
- v. The DVR shall provide a minimum of the following input/output ports:
 - a. NTSC Video Ports as follows:
 - i. Five (5) Camera Bus Solution: Minimum of five (5) video input ports. A DVR with at least six (6) video input ports is preferred in order to allow for future growth.
 - ii. Nine (9) Camera Bus Solution: Minimum of nine (9) video input ports. A DVR with at least ten (10) video input ports is preferred in order to allow for future growth.
 - b. Minimum of one audio input port. A DVR with at least two (2) audio input ports is preferred in order to allow for possible expansion.
 - c. Minimum of four discrete event input ports.
 - d. One port for GPS input. This project includes the integration of a Contractor provided GPS receiver.
 - e. One port for connection of a portable laptop that can be used for DVR configuration, on-board video review, and/or on-board upload.
 - f. One port for connection to the on-board 802.11 WLAN (if 802.11 capability is not built into the DVR)
 - g. One port for connection to J1708 or J1939 Vehicle Area Network for the collection of the following metadata off the vehicle (brakes, turn signals, flashers). If J1708 or J1939 interface is not available, Contractor shall indicate how collection of this type of metadata shall be performed.
- vi. Each video input shall be capable of recording at frame rates of between 1 and 30 frames per second (fps), and at resolutions of between CIF and 4CIF.
- vii. The system shall be capable of configuring each DVR camera input for independent frame rate and resolution settings (e.g., Camera 1 set to 15fps/CIF, Camera 2 set to 20fps/4CIF, etc.).
- viii. WMATA desires the following minimum frame rates and resolutions for each camera:
 - a. Normal (Non-Event) Recording Mode

- i. Front Window Camera (20fps, CIF)
 - ii. Front Door Camera (15fps, 4CIF)
 - iii. All Other Cameras (10fps, CIF)
- b. Event Recording Mode
 - i. Front Window and Front Door Cameras (20fps, 4CIF)
 - ii. All Other Cameras (20fps, 2CIF)

Contractors shall provide as part of their submittal the “Maximum Total Frame Rate” supported by the proposed DVR for each of the listed resolutions.

TABLE 3: Maximum DVR Total Frame Rate For Various Resolutions

Maximum Total Frame Rate For DVR Based On Various Resolutions			
Resolution:	CIF (352x240)	2CIF (704x240)	4CIF (704x480)
Max Total FPS Across DVR			

- ix. The DVR shall be capable of recording video input from black/white, color, day/night, or infrared cameras.
- x. The DVR shall contain an internal clock that shall operate independently of the main power supply. This clock shall have a minimum five (5) year operational lifetime before battery change is required. Clock drift shall be no more than one (1) minute per six months. This clock shall support dates to the year 2035, and shall automatically adjust for all leap years and daylight savings time changes without requiring any user intervention. Additionally, changing of daylight savings time dates shall not require new software, but shall be possible via a simple user change to configuration parameters.
- xi. Additional Metadata (Priced Option): The DVR shall provide an interface (J1708, J1939, or additional discrete inputs) for collection of the following metadata:
 - a. Brakes
 - b. Turn Signals
 - c. Flashers
- xii. The DVR shall provide discrete event inputs for the purpose of tagging event video. One of these inputs will be used for this project, with an option for a second input. They include:
 - a. Event input from the existing ACS Emergency Alarm (Base Solution)
 - b. Event input from a G-Force Sensor (Priced Option)
- xiii. The DVR shall tag the recorded video and audio related to an event. For each event input, the DVR shall support the ability to program a user configurable “Pre-event” and “Post-event” amount of time that defines the beginning and end of the event. The Pre-event and Post-event times shall be configurable from between 0 and 30 minutes. Once recorded, the user shall have the ability to search for video events by event type, bus number and a date/time range.
- xiv. The DVR shall provide the user with the capability of configuring the length of event data storage either for a user configurable number of days, or permanently until the data is either offloaded via the 802.11g/n WLAN or until it is offloaded by the user via laptop and tagged for deletion from the DVR.

- xv. The system shall be capable of configuring the DVR to automatically change frame rate and resolution upon triggering of an event. These changes shall be able to be configured independently for each camera as well as independently for each event type.
- xvi. The DVR shall provide integration to the on-board 802.11g/n WLAN provided by the Contractor. This 802.11g/n WLAN shall either be built-in to the DVR, or connected via an RJ-45 Ethernet connector to the DVR.
- xvii. The DVR shall have the capability of connecting to a laptop (via a USB or Ethernet port) for the purpose of DVR configuration, video data review, or offloading of data directly to the laptop.
- xviii. The DVR shall be integrated with a Contractor provided GPS receiver for the purpose of the following:
 - a. Synchronization of DVR time to GPS time upon boot-up and initialization of DVR
 - b. Logging (as metadata) vehicle speed as calculated by GPS unit
 - c. Logging (as metadata) latitude and longitude associated with video for subsequent playback and display in a map-based video “playback” capability.
- xix. An embedded (non- Microsoft Windows-based) Operating System on the DVR is preferred.
- xx. The DVR shall store and allow for display / review of the following data:
 - a. Video from each camera
 - b. Audio
 - c. Date/Time
 - d. Vehicle Identification/Number
 - e. Camera Identification
 - f. GPS vehicle speed/velocity, latitude, longitude
 - g. Event input status (from G-Force or Emergency Alarm)
 - h. Other metadata (included but not limited to brakes, turn signals, flashers)

The above data will all be synchronized based on time, and reviewable from the Contractor’s video review software; as well as exportable to a non-proprietary or non-licensed software that can be used for dissemination to a third party. (See Section 4 of this SOW)

- xxi. The DVR shall have the ability to review video, audio, event and metadata stored on the DVR via any of the following means:
 - a. Removal of hard drive for external review at Back End workstation (see Section 4 of this SOW)
 - b. Laptop connected directly to the DVR via the DVR USB or Ethernet port
 - c. Workstation or supervisor/police user connected to the DVR via an 802.11g/n wireless link
- xxii. Configuration parameters for the DVR shall be stored in non-corruptible memory on the DVR such that a loss of power or removal of the hard drive does not affect the configuration parameters.
- xxiii. The DVR shall automatically start upon bus engine start, and shall automatically turn off upon bus engine shutoff, or after a user configurable amount of “system shutdown” time after ignition shutoff. This “system shutdown” time shall be configurable between 0 minutes and 45 minutes in increments of one (1) minute. The default “system shutdown” time will initially be 20 minutes.
- xxiv. The DVR shall have a visual status indicator on the front that indicates if the Bus CCTV system is fully operational or not. A Bus CCTV system that is not fully operational shall consist of a

detected failure or non-operating component including but not limited to a DVR, a hard drive, one or more cameras, or a microphone at a minimum.

4.2 Removable Hard Drive

Each bus DVR shall contain a removable hard drive. This removable hard drive shall have the following capabilities:

- i. The DVR shall include a shock mounted removable hard drive that records all of the specified data while onboard the bus.
- ii. The removable hard drive shall be mounted within the DVR enclosure. External hard drives are not acceptable.
- iii. The removable hard drive shall have a key locking device to hold the drive in place.
- iv. The removable hard drive shall be “hot-swappable” and allow for replacement of a new hard drive within a timeframe not to exceed 30 seconds.
- v. Video, audio, event, metadata shall automatically be stored on the removable hard drive in a first-in, first-out linear fashion – with the newest data overwriting the oldest data (with the exception of event data) once the disk is full.
- vi. WMATA desires a minimum of 30 days of video, audio, event and metadata to be stored on the removable hard drive, based on the following criteria:
 - a. 16 hour operating day (i.e., to obtain 30 days of video, storage must be sufficient for 480 hours of data before overwriting.)
 - b. Frame rate as outlined in Section 3.1 of this SOW.
 - c. Resolution as outlined in Section 3.1 of this SOW.

Contractors shall provide as part of their submittal the information outlined in the following tables, based on the disk drive size proposed and the criteria shown. Contractors shall note in their proposals any of these configurations they are unable to support with their proposed DVR (e.g., : If the Contractor’s DVR does not support 9 cameras at 30fps/4CIF, then the Contractor shall state “Not Supported” in the appropriate place in TABLE 6 below.)

TABLE 4: Expected Hours Of Storage For 5 And 9 Bus Configurations

Expected Number Of Storage Hours Based On Required Frame Rate/Resolution	
Five (5) Camera Bus Configuration	
Nine (9) Camera Bus Configuration	

TABLE 5: Expected Hours Of Storage At Various Frame Rates – 5 Camera Config.

Expected Number Of Storage Hours Based On Consistent Frame Rates/Resolutions (Five (5) Camera Bus Configuration)			
Frame Rate / Camera	<u>CIF</u>	<u>2CIF</u>	<u>4CIF</u>
10 fps			
15 fps			

20 fps			
30 fps			

TABLE 6: Expected Hours Of Storage At Various Frame Rates – 9 Camera Config.

Expected Number Of Storage Hours Based On Consistent Frame Rates/Resolutions (Nine (9) Camera Bus Configuration)			
<u>Frame Rate / Camera</u>	<u>CIF</u>	<u>2CIF</u>	<u>4CIF</u>
10 fps			
15 fps			
20 fps			
30 fps			

- vii. Tagged events (Emergency Alarm and optionally G-Force) shall be write-protected until they have either been:
 - a. Uploaded automatically to the server via the 802.11g/n WLAN subsystem
 - b. Uploaded onboard to a laptop and marked for deletion by the laptop user.
 - c. Uploaded by removing drive and marked for deletion by the workstation user.
- viii. The removable hard drive shall be independent of the configuration parameters for the DVR. In other words, configuration parameters shall be stored within the DVR, not the hard drive such that removal / replacement of a new hard drive in a DVR does not affect the configuration parameters of the DVR.
- ix. Contractor shall provide ten (10) spare removable hard drives as part of the Phase 1 procurement.

4.3 Cameras

Each bus shall contain either five (5) cameras (for 26' to 42' vehicles) or nine (9) cameras (for articulated vehicles). All new camera equipment shall be proposed for this project. Existing camera cable may be reused at the Contractor's discretion; however, the Contractor shall be responsible for the warranty and maintenance of the cable as if it were installed as new. (See Section 10.0 of this SOW for a complete description of the Warranty and Maintenance requirements.) The proposed camera technology shall meet all of the following requirements.

- i. Camera positions for the five (5) camera and nine (9) camera buses shall be according to the following general locations:
 - a. Camera Positions For Both Five (5) Camera and Nine (9) Camera Buses:
 - i. Camera 1: Forward facing camera with view through the front windshield
 - ii. Camera 2: View of front door and farebox area
 - iii. Camera 3: Mounted near front of bus with a front to rear view
 - iv. Camera 4: View of rear door and a portion of the rear seats
 - v. Camera 5: External (outside) side view camera on curbside of bus (NOTE: For 5 camera buses, this camera shall be mounted between the front of the bus and the front door, and the camera shall face the rear of the bus. For 9 camera buses, this camera shall be mounted behind the rear door of the bus facing forward.)

- b. Remaining Camera Positions For Nine (9) Camera Buses Only:
 - i. Camera 6: Mounted near articulated area facing rear.
 - ii. Camera 7: Mounted in the rear of the articulated area facing forward.
 - iii. Camera 8: Mounted near articulated area, facing forward.
 - iv. Camera 9: External (outside) rear view camera mounted on rear of bus.
- ii. Cameras shall capture high quality video in various lighting conditions from bright sunshine with glare to low light conditions that occur on the bus at night.
- iii. All cameras shall be NTSC.
- iv. All cameras shall have internal synchronization
- v. All cameras shall be powered off of the DVR power.
- vi. All cameras shall be mounted in a secure vandal-resistant housing, with either a key-lock design or tamper-proof screw design.
- vii. All cameras shall have automatic backlight compensation.
- viii. Camera 1 (Forward Facing Camera).
 - a. Camera 1 shall be mounted so as to have a view through the front windshield within the area that is covered by the windshield wipers. This camera shall be mounted so as not to come into contact with the rearview mirror at any time.
 - b. Camera 1 shall have a minimum resolution of 470 TV Lines (TVL)
 - c. Camera 1 shall be a color day/night camera (automatically switching from color to black/white in low-light conditions) with operation down to at least 0.3 Lux.
 - d. Camera 1 is preferred to have a varifocal lens with a range of at least 4-8mm.
- ix. Camera 2 (Front Door Camera).
 - a. Camera 2 shall be mounted so as to have a view of the front door, steps and farebox area.
 - b. Camera 2 shall have a minimum resolution of 470 TV Lines (TVL)
 - c. Camera 2 shall be a color day/night camera with infrared illumination (either through built-in IR illuminators, or a separate external IR illuminator) with operation down to 0.0 Lux.
- x. Camera 5 (External Curb-Side View Camera).
 - a. Camera 5 shall be mounted on the outside (curbside) of the bus, and shall have a sturdy design able to stand up against the normal external wear and tear of a bus due to tree branches, bus washes, etc.
 - b. Camera 5 shall have a minimum resolution of 420 TV Lines (TVL)
 - c. Camera 5 shall be a color day/night camera (automatically switching from color to black/white in low-light conditions) with operation down to at least 0.1 Lux.
 - d. Camera 5 shall have a focal length appropriate for viewing the curb-side of the bus.
- xi. Camera 9 (Rear View Camera – Articulated Buses).
 - a. Camera 9 shall be mounted on the outside (rear) of the bus, and shall have a sturdy design able to stand up against the normal external wear and tear of a bus due to tree branches, bus washes, etc.
 - b. Camera 9 shall have a minimum resolution of 420 TV Lines (TVL)
 - c. Camera 9 shall be a color day/night camera (automatically switching from color to black/white in low-light conditions) with operation down to at least 0.1 Lux.
 - d. Camera 9 shall have a wide-angle lens sufficient for providing at least a 90-degree angle of coverage.

- xii. Cameras 3,4,6,7,8 (All Cameras With Internal Bus Views).
 - a. These cameras shall be ceiling or wall mounted in the general area as outlined earlier in this SOW.
 - b. These cameras shall have a minimum resolution of 470 TV Lines (TVL)
 - c. These cameras shall be color day/night cameras (automatically switching from color to black/white in low-light conditions) with operation down to 0.1 Lux.
 - d. These cameras shall be available in focal lengths of between 2.9mm and 8.0mm.
- xiii. Under all operating conditions and applications, the camera images shall be of sufficient quality to distinguish facial features, apparel details and activity. Still and video images obtained from the system must be of sufficient quality to support prosecution of offenders and resolution of legal claims.
- xiv. WMATA shall have the final approval for the focal length, angle of view and placement of each camera in the bus. This information will be finalized during the initial installation of each bus style.

4.4 Audio

Each bus shall have one (1) microphone installed to provide audio recording in the area in direct proximity to the front door, farebox and bus operator. This microphone shall have the following capabilities:

- i. The audio microphone provided shall be capable of recording clearly audible passenger-operator voice communication.
- ii. The microphone shall be mounted either internal to one of the camera housings near the front of the bus, or in its own housing. The microphone shall not be susceptible to water leaking from the bus ceiling.
- iii. Recorded audio shall be time synchronized with the video and other event and metadata.
- iv. The audio shall be clearly audible over the background noise typical of an operating transit vehicle, such as heat/AC, fans, engine noise, windshield wipers, normal road noise, etc.
- v. The DVR shall be capable of configuring the audio to be turned on or off.

4.5 802.11 Mobile Wireless

The Contractor shall procure and install on each bus, the required 802.11 WLAN hardware/software necessary to communicate between the WMATA division wireless infrastructure and the bus, as well as to communicate between the bus and one or more Supervisor / Police vehicles that are within range of the bus. The following are a list of the requirements associated with the 802.11 Mobile Wireless on the bus.

- i. The 802.11 mobile wireless equipment on the Transit Vehicle shall support either 802.11g, 802.11n or both.
- ii. The Transit Vehicle Onboard 802.11 wireless shall support all of the following wireless functionality:
 - a. Automatic upload of "Event" video, audio and metadata from the bus to the Back Office Server(s) upon return of the bus to any WMATA division equipped with 802.11 WLAN.
 - b. Automatic upload of any "Requested Video", audio and metadata from the bus to the Back Office Server(s) upon return of the bus to any WMATA division equipped with

- 802.11 WLAN. (NOTE: See Section 4 of this SOW for a description of “Requested Video”.)
- c. Automatic upload of “Health Check” data from the bus to the Back Office Server(s) upon return of the bus to any WMATA division equipped with 802.11 WLAN. (NOTE: See Section 4 of this SOW for a description of “Health Check”.)
- d. Automatic download of new DVR software/firmware/configuration parameters from the Back Office to one, several or all buses upon return of buses to any WMATA division equipped with 802.11 WLAN.
- e. Ability for a Supervisor / Police vehicle (within at least 100 yards of wireless range) to view live video/audio/metadata from the Transit Vehicle, as well as to download selected historical data from the Transit Vehicle to the Supervisor / Police vehicle.
- iii. The 802.11 mobile wireless on the Transit Vehicle must be capable of communicating with the Cisco Wireless Routers installed at the division(s).
- iv. The Transit Vehicle Bus 802.11 must support WPA2 encryption.
- v. The 802.11 mobile wireless antenna on the Transit Vehicle shall be mounted on the roof of the Transit Vehicle. The antenna mount shall be sealed to eliminate the possibility of water leakage, and shall be a sufficient distance from other antennas on the roof so as to eliminate interference issues. [NOTE: Contractor’s are allowed to use one antenna for both 802.11 WLAN and GPS if such a dual mode antenna is part of their standard configuration of equipment.]

4.6 GPS

Each bus shall have one (1) GPS Receiver installed to provide the features and capabilities outlined in this section. [NOTE: As an alternative, the Contractor may provide an interface to one of the existing GPS receivers on the bus. These include a Garmin GPS receiver from the ACS CAD/AVL system that is installed on all of the buses, or a GPS Receiver from Clever Devices that is installed on some of the buses. If this option is chosen, it is the responsibility of the Contractor to coordinate this work with either ACS or Clever Devices, acquire any licenses associated with this interface, and receive written assurances (to be included in the Contractor’s proposal response) from ACS or Clever Devices that this interface will not affect any current warranty/maintenance agreements in place between WMATA and ACS or Clever Devices].

- i. The following functions related to the GPS Receiver shall be performed by the Bus CCTV system:
 - a. Synchronization of the DVR clock to GPS time upon each boot-up of the DVR.
 - b. Collection of vehicle speed data from the GPS for storage as metadata on the DVR.
 - c. Collection of vehicle latitude / longitude data from the GPS for storage as metadata on the DVR, and subsequent use in the video map-based playback capability (see Section 4 of this SOW)
- ii. The GPS Receiver shall be a minimum 12 channel receiver.
- iii. The GPS Receiver antenna shall be mounted on the roof and be of a low-profile type. Contractor shall be responsible for ensuring the antenna mount is sufficiently far from other previously installed antennas (Radio, 802.11, GPS) so as to ensure no interference issues.

4.7 Interface to Existing Emergency Alarm

On each bus, the Contractor shall install an interface between their DVR and the existing ACS Emergency Alarm (EA) switch. This interface cable shall be connected to the DVR discrete event input for the purpose of triggering a video event whenever the bus operator triggers an EA on the ACS system. A total of 10 minutes of video, audio and metadata shall be collected and write-protected with this event (5 minutes before and 5 minutes after), but this pre-event time and post-event time shall be user configurable as outlined in Section 3.1 above. Also, this EA switch shall trigger a change in the frame rate and resolution being recorded on the DVR per the requirements outlined in Section 3.1 above.

4.8 G-Force Sensor (Optional)

As a separately priced option, each bus shall have one (1) G-Force Sensor installed to provide the features and capabilities outlined in this section.

- i. The G-Force Sensor shall support a minimum of two (2) directions (x, y) and shall have a configurable setting of between 2G and 6G. A three (3) direction G-Force Sensor is preferred.
- ii. When the configured G-Force setting is equaled or exceeded, the G-Force sensor shall trigger an event on the DVR.
- iii. A total of 10 minutes of video, audio and metadata shall be collected and write-protected with this event (5 minutes before and 5 minutes after), but this pre-event time and post-event time shall be user configurable as outlined in Section 3.1 above. Also, this G-Force sensor shall trigger a change in the frame rate and resolution being recorded on the DVR per the requirements outlined in Section 3.1 above.
- iv. G-Force sensors shall be configured appropriately for each vehicle type and mounting location, and approved by WMATA.

4.9 Other Metadata (Optional)

As a separately priced option, each bus shall be cabled and configured to collect the following metadata: Brakes, Turn Signals, Flashers.

- i. WMATA prefers that this data be collected off of the J1708 or J1939 interface. However, other interfaces (such as directly cabled discrete inputs) are acceptable.
- ii. Metadata shall be synchronized and stored on the removable hard drive with the video and other associated metadata (speed, latitude, longitude), etc..
- iii. Metadata shall be viewable via the Back Office Subsystem software (see Back Office requirements for details).

4.10 Power and Environmental Test Requirements

The WMATA Bus CCTV Onboard Subsystem shall meet the following power and environmental standards and requirements:

- i. All materials and equipment installed under this contract shall be new, unused, free of defects and of current manufacture. Prototype or discontinued models are not acceptable. All software shall be the most current, stable version available for the proposed equipment.

- ii. The DVR shall be capable of operating on either a nominal 12VDC or 24VDC power. It shall have an operating range of at least 9VDC – 30 VDC. All other on-board devices shall operate off of DVR power.
- iii. The system shall be able to tolerate (without loss of data) power spikes and losses commonly found on a transit bus.
- iv. The system shall include a battery backup capability that will continue to power the Bus CCTV System for at least 1 minute after total loss of power from the bus battery.
- v. Contractors shall provide (as part of the proposal response) information as to the total power consumption that can be expected for both the Five (5) Camera Bus and Nine (9) Camera Bus Configurations.
- vi. All Bus CCTV equipment, including all cables and connectors to and from the DVR, shall be electrically protected to withstand low voltage, high voltage and electrical spikes resulting from jump-starting.
- vii. The Contractor shall be responsible for any filters, power stabilizers, and other devices that protect the DVR and other equipment from spikes, drops, and other power issues routinely experienced in a transit environment.
- viii. The Contractor shall ensure that the Bus CCTV system fully performs as intended without being affected by, or causing interference to, other on-board systems. Protection shall be provided against radio frequency and electromagnetic interference (RFI/EMI) emission sources such as those produced by the bus RF radio system, 802.11 wireless from other onboard systems, etc.
- ix. The system shall meet all applicable SAE J1455 “Equipment Environment Standards” for temperature, vibration, shock and humidity.
- x. All CCTV camera enclosures shall be lockable (or have tamper proof screws), vandal and shock resistant, and made of a non-toxic material. Camera domes shall not fog up. Camera alignment shall be accomplished with mechanical fasteners that shall not be sent out of adjustment due to shock or vibration.
- xi. WMATA has had considerable problems with existing cameras, where water leaks from the roof of the bus into roof mounted cameras causing camera malfunction or failure. For this reason, WMATA prefers internal cameras with a minimum rating of IP65, and external cameras with a minimum rating of IP66. Contractor shall state in their proposal (see TABLE 7 above) the IP rating of all cameras. If the proposed camera does not have the WMATA preferred IP rating, or the camera’s IP rating is “Unknown”, then Contractor shall state in proposal what steps it plans on taking to eliminate water intrusion. In all cases, Contractor shall be responsible for the cost associated with replacing cameras that fail, even when that failure is due to water intrusion.
- xii. WMATA prefers a DVR with an IP65 rating. Contractors shall provide (as part of their proposal response) the IP rating of the proposed DVR.
- xiii. Contractors shall provide (as part of their proposal response) information regarding the environmental testing performed on each of the components as outlined in TABLE 7 below. For any components that have not been tested, or where this information is unknown, simply state “Unknown”. Contractor shall be prepared to provide official test results for each of the following environmental tests upon request from WMATA.

TABLE 7: Environmental Test Results For Bus CCTV Components

Component	Operating Temp. Range	Storage Temp. Range	Humidity	Operating Vibration	Operating Shock	IP Rating
DVR						
Removable Hard Drive						
Camera 1						
Camera 2						
...						
Camera 9						
802.11 g/n Wireless						
GPS						
G-Force						

5.0 Back Office Subsystem

This section provides detailed specifications for the Back Office Hardware/Software Subsystem, including the following:

5.1 Workstation/Laptop Hardware And System Software

This section provides detailed specifications for the workstation/laptop hardware and system software to be used for the WMATA Bus CCTV project. It also identifies which portions of the hardware / system software shall be provided by WMATA vs. that which shall be provided by the Contractor.

- i. All workstation hardware, operating system software, and non-Bus CCTV system software used within WMATA's fixed (back office) locations shall be provided by WMATA.
- ii. All laptop hardware, operating system software, and non-Bus CCTV system software used for Back Office laptops (those that will be used for configuring DVRs and/or offloading video data from a bus) shall be provided by WMATA.
- iii. All Supervisor / Metro Police Vehicle On-Board laptop hardware, operating system, and system software shall be provided by the Contractor. (See specifications outlined in Section 5.1 of this SOW)
- iv. All application software in the Contractor's solution shall be able to operate on existing WMATA desktop workstations or laptops as outlined below. In this section, WMATA has provided information about their "standard" and "high end" workstation and laptop configurations.
- v. The Contractor shall perform all workstation/laptop related installation services as outlined in Section 6.2 of this SOW.
- vi. WMATA's minimum hardware standards are defined in terms of two basic and two advanced configurations. Desktop I is the standard desktop. Desktop 2 is the high-end desktop. Laptop 1 is the standard laptop. Laptop 2 is the high-end laptop. Contractor shall highlight (in their proposal response) any of their workstation/laptop requirements that are in conflict with the WMATA standards outlined below.

Desktop 1 – Standard Desktop	
System Attribute	Attribute Specification
Vendor:	Dell
Name:	Optiplex 755 Minitower
Catalog number:	84 RCRC963956-1983000
Processor:	Intel Core 2 Duo Processor E4500 (2.2 GHz, 2M, 800MHz FSB)
Memory:	2 GB DDR2 Non-ECC SDRAM, 667 MHz (2 DIMM)
Keyboard:	Dell USB Keyboard, no hot keys
Monitors:	CFI, Metro, DIS, FPL, 17, DAO
Video Card:	Integrated Video, Intel GMA3100
Hard Drive:	160 GB SATA 3.0 Gb/s and 8MB DataBurst Cache
Floppy Disk Drive:	No floppy drive
Operating System	Windows Vista Business Downgrade, XP Pro Installed, English
Mouse:	Dell USB Optical Mouse with Scroll, all black design
Media:	48x32 CDRW/DVD
Speakers:	Internal Dell Business Audio Speaker

Desktop 2 – High-End Desktop	
System Attribute	Attribute Specification
Vendor:	Dell
Name:	Precision Workstation T3400 375W (32 bit)
Catalog number:	84 RCRC963956-1992211
Processor:	Intel Core 2 Duo Processor E4600 (2.4 GHz, 2MB, 800MHz, L2) 375W
Memory:	4 GB, 800MHz, DDR2, SDRAM, ECC (4 DIMMs)
Keyboard:	USB Entry Quietkey, no hot keys
Monitors:	No monitor
Graphic Cards:	512 MB PCIe x16 nVidia Quadro FX1700, Dual Monitor DVI Cable
Hard Drive:	160 GB SATA 3.0 Gb/s with NCQ and 8MB DataBurst Cache
Floppy Disk Drive:	3.5 inch 1.44 MB Floppy Drive
Operating System	Windows Vista Business Downgrade, XP Pro Installed, English
Mouse:	Dell USB 2-Button Mechanical Mouse with Scroll
Media:	16x DVD+/-RW w/Cyberlink PowerDVD and Roxio Creator Dell Ed
Speakers:	No speaker option

Laptop 1 – Standard Laptop	
System Attribute	Attribute Specification
Vendor:	Dell
Name:	Mainstream D Series – Latitude D630
Catalog number:	84 RCRC963956-1983076
Processor:	Intel Core 2 Duo Processor T7500 (2.20 GHz, 4M, 800MHz, L2)
LCDs:	14.1-inch Wide Screen WXGA LCD Panel
Memory:	1 GB, DDR2-667, SDRAM, 2 DIMMs
Keyboard:	Internal English Keyboard
Graphics:	128MB NVIDIA Quadro NVS 135M
Hard Drive:	80 GB, 9.5MM, 5400RPM
Floppy Disk Drive:	No Floppy Drive
Operating System	Windows Vista Business Downgrade, XP Pro Installed, English
Mouse:	Standard Touchpad
Media:	24x CD-RW/DVD w/ Cyberlink PowerDVD
Wireless LAN:	Intel 3945 802.11a/g Dual-Band Mini Card
Batteries:	6 Cell Primary Battery

Laptop 2 – High-End Laptop	
System Attribute	Attribute Specification
Vendor:	Dell
Name:	Highend D Series – Latitude D830
Catalog number:	84 RCRC963956-1983123
Processor:	Intel Core 2 Duo Processor T7500 (2.20 GHz, 4M, 800MHz, L2)
LCDs:	15.4-inch Wide Screen WXGA LCD Panel
Memory:	1 GB, DDR2-667, SDRAM, 2 DIMMs
Keyboard:	Internal English Keyboard
Graphics:	Intel Integrated Graphics Media Accelerator X3100
Hard Drive:	80 GB, 9.5MM, 5400RPM
Floppy Disk Drive:	No Floppy Drive
Operating System	Windows Vista Business Downgrade, XP Pro Installed, English
Mouse:	Standard Touchpad
Media:	24x CD-RW/DVD w/ Cyberlink PowerDVD
Wireless LAN:	Intel 3945 802.11a/g Dual-Band Mini Card
Batteries:	9 Cell Primary Battery

Laptop Docking Station	
Vendor	Standard Product
Dell	Dell D/Dock Expansion Station (Used for notebook models D430, D630 & D830.)

5.2 Removable Drive Docking Station / Connection

This section provides detailed specifications for the docking stations (or equivalent) to be provided by Contractor for the purpose of review of video/audio/event/metadata off of the removable hard drive while in the Back Office.

- i. The Contractor shall provide fifteen (15) docking stations (or equivalent) as part of the Base System proposal for the purpose of reviewing and retrieving video/audio/event/metadata from a removable hard drive while on a Back Office workstation or laptop.
- ii. Each docking station (or equivalent) shall be capable of being connected directly to a Back Office workstation/laptop via a USB or network connection.
- iii. Upon insertion of the removable hard drive into the docking station (or equivalent), the user shall be able to review any/all data stored on the removable disk drive.

5.3 Server Hardware / System Software

This section provides detailed specifications for the server hardware and system software to be used for the WMATA Bus CCTV project. It also identifies which portions of the hardware / system software shall be provided by WMATA vs. that which shall be provided by the Contractor.

- i. All server hardware, server operating system software, and non-Bus CCTV server system software shall be provided by WMATA.
- ii. Contractor shall provide (as part of the proposal response) a description of the appropriate, fully redundant Dell server hardware configuration that can support the Contractor's proposed application software solution. (NOTE: For virtual machines, WMATA uses VMware ESX v3.0).
- iii. Section 4.6 of this SOW requires the Contractor to propose their recommended Back Office Data Store (i.e., Single Server, Multiple Servers). If Contractor recommends "Multiple Servers", then Contractor shall provide (as part of the proposal response) appropriate Dell server hardware configurations for each of the Multiple Servers proposed.
- iv. The Contractor shall perform all server related installation services as outlined in Section 6.2 below.
- v. The following tables describe WMATA's recommended configurations for server equipment for standard and enterprise workloads. (Enterprise servers should be configured at both primary and remote sites, in cluster formation, with active failover to support high availability.).

Standard Server – Recommended Basic Configuration	
System Attribute	Attribute Specification
Vendor	Dell
Model	Power Edge 2950
Processor (CPU)	1x Quad Core Xeon L5410, 2.33GHz
Memory (RAM)	4GB
Hard Disk	(3 to 5) x 146GB RAID5
Monitor & VRAM	DX Central 832 with X-Remote interface connection cable (XRICCs)-PS2
Miscellaneous	USB keyboard, USB optical mouse, PERC SCSI controller, Redundant power supplies, DVD/CD-RW
Operating System	Windows Server 2003 R2 Standard Edition (32-bit is preferred, but 64-bit Server 2008 will become the standard in the near future)
Network Connection; High Bandwidth	Dual 10/100BaseT/1000MT Ethernet ports

Enterprise Server – Recommended Basic Configuration	
System Attribute	Attribute Specification
Vendor	Dell
Model	Power Edge R900
Processor (CPU)	4x Quad Core Xeon E7330, 2.4GHz
Memory (RAM)	16GB
Hard Disk	(3 to 5) x 146GB RAID5
Monitor & VRAM	17” LCD, 32MB VRAM
Miscellaneous	USB keyboard, USB optical mouse, PERC SCSI controller, Redundant power supplies, DVD/CD-RW
Optional Parts	1.44 floppy, rack rails (if racked)
Operating System	Windows Server 2003 R2 Enterprise Edition (32-bit is preferred, but 64-bit Server 2008 will become the standard in the near future)
Network Connection; High Bandwidth	Dual 10/100BaseT/1000M Ethernet ports
Network Connection; High Availability	2 Host Bus Adapters for SAN

5.4 Network And 802.11 Division Wireless

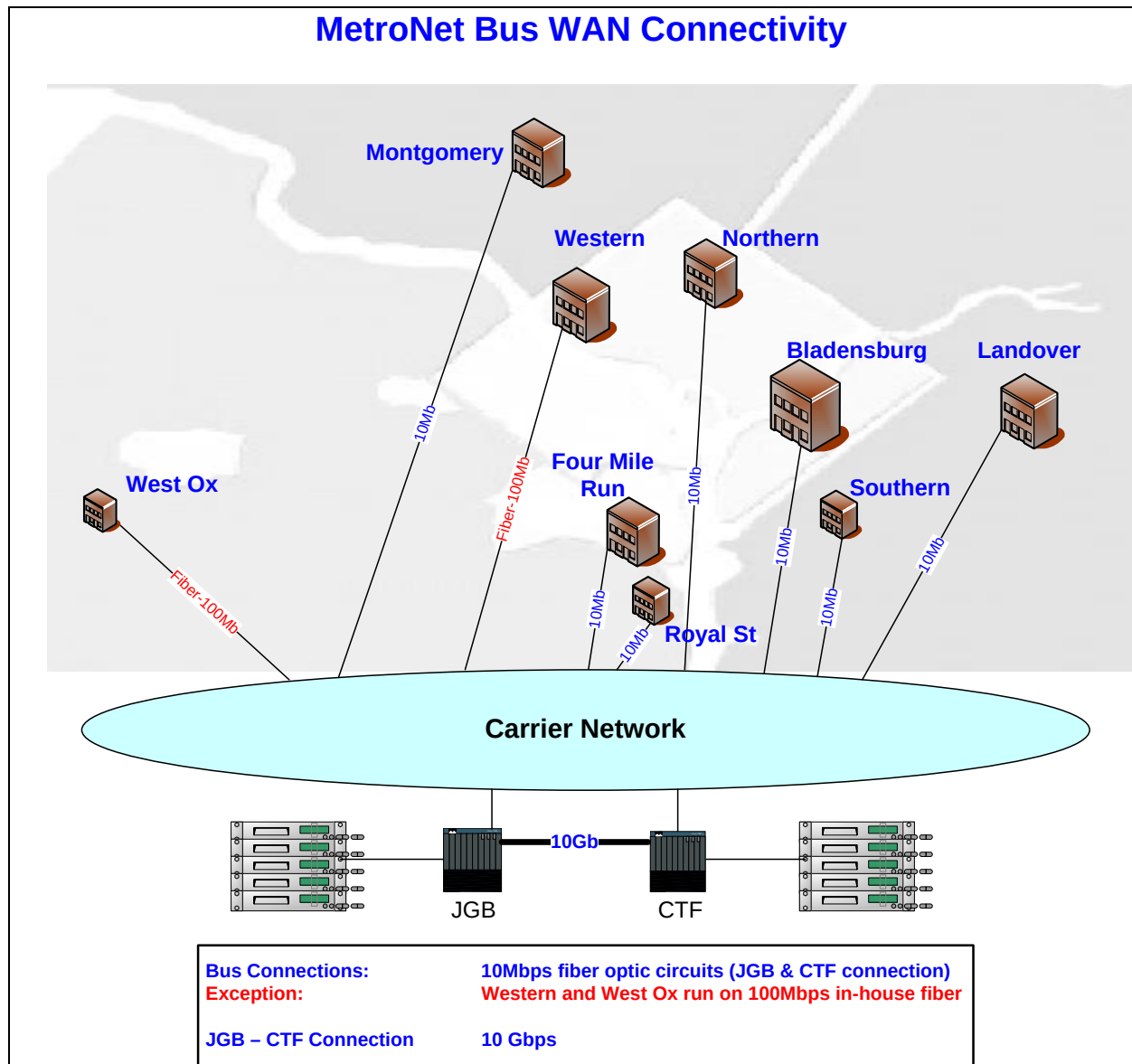
WMATA maintains a large Wide Area Network (WAN) in support of its overall mass transit role. The WMATA WAN architecture utilizes service providers to supply broadband connectivity for its off right-of-way (Off-ROW) bus garages and administrative building locations, and disaster recovery connectivity for its on right-of-way (On-ROW) data communications network (Metro-Net).

Fiber based broadband Ethernet connectivity with an interface speed of 100 Mbps is installed at two host locations—the Jackson Graham Building (JGB) and the Carmen Turner Facility (CTF). End-of-line rail locations and fourteen non-rail locations are serviced by 10Mbps connectivity. Of the nine bus garage locations, seven are serviced by these 10Mbps connections, while two locations are serviced by 100Mbps in-house fiber connections.

The WMATA owned and maintained On-ROW network (Metro-Net) has been designed to provide external network connectivity and redundancy.

Metro-Net is a carrier-grade MPLS network serving WMATA's data communication needs for voice, data, and video. All On-ROW locations are supported using WMATA-managed fiber optic cable. Metro-Net is both a logical ring and Mesh design with two primary core host nodes located at JGB (600 5th St., Washington, DC) and CTF (3500 Pennsy Dr., Hyattsville MD). There are six core hub nodes that connect back to each of the two core host facilities and 94 rail and yard stations, each of which is associated with a sub-tending ring collapsing back to one of the six nodes. Metro-Net provides 10Gbps connectivity between the host and core hub nodes and 1Gbps connectivity to the nodal rail station locations.

The following diagram provides a high-level view of WMATA's WAN connectivity supporting its bus garage locations.



The Contractor shall provide a Bus CCTV System solution that is compatible with WMATA's overall data network and WAN architecture, connectivity, and bandwidth parameters. The Contractor shall comply with the following network related requirements:

- i. Contractor's Back Office Data Store solution (as outlined in Section 4.6 of this SOW) shall support the wireless uploading of data based on the following criteria:
 - a. Data throughput maximums as outlined in the above network diagram.
 - b. 50% of the 802.11g/n division wireless available bandwidth is taken up by uploads occurring from other onboard applications.
 - c. Achievable vs. theoretical 802.11g/n throughput
 - d. "% availability" of WMATA WAN network links assumed to be the following:
 - i. Maximum 20% availability for any one link

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- e. 1% of all buses will have an EA event on any given day
- f. 1% of all buses will have a G-Force event on any given day
- g. 2% of all buses will have to respond to a “Requested Video” query on any given day.
This query will be (on average) 15 minutes in length.
- h. All buses will upload “Health Check” data once a day
- i. The number of buses per division is as follows:

DIVISIONS	ASSIGNMENTS						SCHEDULES				
	ACTUAL	MAX	STRA-				A M	P M	BASE	SAT	SUN
BUSES	SKED	TEGIC	MAX			TOTAL	REG	REG	REG	MAX	MAX
	FLEET	FLEET	FLEET	SPARES	FLEET	FLEET	FLEET	FLEET	FLEET	FLEET	FLEET
BLADENSBURG	273	235	3	238	35	273	235	232	109	73	62
NORTHERN	172	140	4	144	28	172	140	132	75	67	52
SOUTHERN AVE	129	107	4	111	18	129	107	107	40	38	33
WESTERN	132	114	1	115	17	132	114	110	48	53	41
ARLINGTON	94	80	2	82	12	94	78	80	29	0	0
FOUR MILE RUN	224	191	4	195	29	224	189	191	53	96	65
LANDOVER	167	139	3	142	25	167	128	139	54	51	34
MONTGOMERY	205	167	4	171	34	205	167	165	71	54	41
ROYAL STREET	79	67	0	67	12	79	66	67	17	0	0
SYSTEM TOTAL	1475	1240	25	1265	210	1475	1224	1223	496	432	328

- j. Amount of available time for data upload from a bus (including a 20 minute System Shutdown time) is 30 minutes per day.
- k. Up to 50% of buses can arrive in division at one time.
- l. Buses will not return to the division simultaneously, nor will they return in an evenly distributed fashion.
- ii. Based on all of the above criteria, Contractor shall provide (as part of the proposal) a calculation showing how their proposed server and wireless solution will meet these requirements.
- iii. Contractor’s onboard 802.11g/n wireless solution shall be compatible with WMATA’s standard 802.11Cisco Wireless Router solution in the divisions.
- iv. Contractor’s “Requested Video” solution (see Section 4.5 below) shall allow for an authorized Bus CCTV System user to setup a request for video anywhere from within the WMATA WAN.
- v. Contractor shall be capable of reviewing stored video data from anywhere on the WMATA WAN, without having to identify a server location.
- vi. Video/audio/event/metadata shall be retrievable from any bus within range of a WMATA wireless access point
- vii. Video/audio/event/metadata shall be retrievable by a properly equipped WMATA Supervisor / Police vehicle within 100 yards of any WMATA equipped Bus CCTV System.
- viii. Wireless devices on the bus shall support 802.11 g/n and shall be encrypted to WPA2 and secured from unauthorized wireless access.
- ix. The Contractor’s design shall be reviewed by WMATA’s IT Security group and must comply with WMATA’s IT Security policies and procedures.

5.5 Back Office Software

The Contractor shall provide and install all software necessary for the WMATA Bus CCTV System, in accordance with the following specifications:

- i. All Bus CCTV System application software shall be capable of functioning on the WMATA provided workstations, laptops, server and network hardware and operating system as specified in this SOW.
- ii. All Bus CCTV System application software shall be provided with a site license that has no restrictions on number of users or installations within WMATA.
- iii. The Contractor shall provide and install Mobile Video Manager (MVM) software on WMATA designated workstations and laptops. This Mobile Video Manager (MVM) software shall contain the following functions.
 - a. In general, the MVM software shall provide the capability to setup and download configuration parameters to the DVR; review and analyze video, audio, event and metadata, and configure the software for various user accounts and privileges.
 - b. The MVM software shall allow the user to review video/audio/event/metadata in the following modes:
 - i. From a laptop computer directly connected to a DVR, via a USB or network cable connection
 - ii. From a workstation or laptop directly connected to a Docking Station (or equivalent) via a USB or network cable connection.
 - iii. From a file previously exported from the MVM software, and stored on digital media (hard disk, CD, DVD, etc).
 - iv. From a workstation or laptop wirelessly connected to a Transit Vehicle CCTV system.
 - c. The MVM software shall allow the user to view, modify, and generally configure a DVR while connected to that DVR via a direct or wireless connection. The following parameters shall be configurable from within the MVM software:
 - i. Unique DVR identifier: Shall be set to the bus number.
 - ii. System Shutdown parameter: Indicates how long the Bus CCTV system shall continue recording after the bus ignition is turned off.
 - iii. Network Parameters: Ability to configure the DVR for different network configurations such as static IP, DHCP, etc.
 - iv. Audio Parameters: Ability to turn on/off audio for each channel of audio on the DVR, as well as to configure the quality of audio.
 - v. Normal Video Frame Rate: Configurable for each camera for selected values between 1fps and 30fps
 - vi. Event Video Frame Rate: Configurable for each camera for selected values between 1fps and 30fps
 - vii. Ability to configure different frame rates for each camera in either normal or event mode.
 - viii. Normal Video Resolution: Configurable for each camera for video qualities of at least CIF, 2CIF, and 4CIF.

- ix. Event Video Resolution: Configurable for each camera for video qualities of at least CIF, 2CIF, and 4CIF.
 - x. Ability to configure different video resolutions for each camera in either normal or event mode.
 - xi. Event Parameters: Ability to configure (for each event) pre-event and post-event times from between 0 and 30 minutes. Also the ability to configure the DVR to store event data on the DVR for "X" number of days (where "X" is user definable) before deleting, or to store the event data permanently until the event is either: a) Uploaded over wireless, or b) uploaded via direct connection and deleted by the user.
 - xii. The system shall be capable of configuring the DVR to change frame rate and resolution upon triggering of an event. These changes shall be able to be configured independently for each camera as well as independently for each event type.
- d. MVM shall provide the user with the ability to search for and select video clips based on any combination of the following criteria:
- i. Bus Number
 - ii. Date, Time
 - iii. Event Type
- e. MVM shall allow the user to perform the following functions while reviewing video/audio/event/metadata:
- i. Play (Forward/Reverse)
 - ii. Fast Forward/Fast Reverse (2X, 4X, 8X)
 - iii. Drag a timeline scrollbar forward or backward in time
 - iv. View any number of camera views at a time (from 1 to N, where N is the max number of cameras on that DVR).
 - v. Turn audio on/off with video review.
 - vi. Turn metadata on/off with video review
 - vii. Export video/audio/event/metadata to a digital file in either secure watermarked format, or non-secure commercial format such as .AVI. Exported file shall be able to be stored on any digital format (hard drive, CD, DVD, USB thumb drive, etc.)
 - viii. Export a single video image to standard image format (.bmp, .jpg, .tiff) either with or without metadata included.
 - ix. Print a single video image to an attached printer either with or without metadata included.
 - x. All metadata associated with the video (including but not limited to: Bus number, date, time, camera identifier, event type, speed, latitude/longitude) shall be in time-synch with the video and audio, and shall be capable of being viewed, exported and/or printed. The system shall also allow for the addition of future metadata.
- f. MVM shall have a map-based video review (playback) capability that allows the user to view the movement of the bus on top of a map display while reviewing the video/audio/event/metadata. This movement of the bus on the map display shall remain

- in time-synch with the video/audio/event/metadata being reviewed. The map display shall be based on the latitude/longitude metadata stored with the video/audio data.
- iv. The Contractor shall provide and install a license free version of MVM-like software that can be used for 3rd party (police, courts) review of video/audio/event/metadata. This software shall be easy to install and execute (e.g., as a single executable file), and not require training or detailed instructions when sending to a 3rd party unfamiliar with the software.
 - v. The Contractor shall provide and install Mobile Video Wireless Management (MVWM) software on WMATA designated servers, workstations, and/or laptops. This Mobile Video Wireless Management (MVWM) software may be embedded in the MVM software or a separate application, but shall contain the following functions.
 - a. Automatic upload of “Event” video, audio and metadata from the bus to the Back Office Server(s) upon return of the bus to any WMATA division equipped with 802.11 WLAN.
 - b. Ability to setup a “Requested Video” query by entering a bus number, date, and time range; with a designated “identifier label” for the query.
 - c. Automatic upload of the above “Requested Video” data (including video, audio and metadata) from the bus to the Back Office Server(s) upon return of the bus to any WMATA division equipped with 802.11 WLAN.
 - d. Ability to setup “Health Check” subsystem that will notify WMATA if there is a failure of one or more of the following components on a bus (DVR, hard drive, camera(s), audio, non-reporting of vehicle for last “x” days).
 - e. Ability to store all “Health Check” history in a database or data store for later review.
 - f. Ability to view a list of “Health Check” issues by bus number.
 - g. Ability to stamp each “Health Check” item with bus number, date and time.
 - h. Automatic upload of “Health Check” data from the bus to the Back Office Server(s) upon return of the bus to any WMATA division equipped with 802.11 WLAN access points.
 - i. Automatic email notification (to multiple email addresses) of an uploaded “Health Check” item.
 - j. Automatic download of new DVR software/firmware/configuration parameters from the Back Office to one bus, a group of buses, or all buses.

5.6 Back Office Data Store

The Contractor shall provide and install a Back Office Data Store on the WMATA supplied server or servers that will meet the following specifications:

- i. The Back Office Data Store shall contain all of the following data:
 - a. All “Event” data automatically uploaded via wireless
 - b. All “Requested Video” data automatically uploaded via wireless
 - c. All “Health Check” data automatically uploaded via wireless
 - d. Any other data exported by user from MVM software, that user desires to be stored in Back Office Data Store.
- ii. All MVM and MVWM search and query functions shall (by default) search data in the Back Office Data Store.
- iii. If the Contractor uses commercial database software (e.g., ORACLE, Microsoft SQL Server, etc.) for any of the Back Office Data Store, then it is the responsibility of the Contractor to provide, install and configure the commercial database software. WMATA shall have final approval on

- any commercial database software. Contractor shall identify (as part of the proposal submittal) any commercial database software it requires for its Back Office Data Store solution.
- iv. WMATA understands that there are numerous potential Contractor solutions for implementation of the Back Office Data Store. They include:
- a. Central Server Data Store
 - b. Distributed Data Store over several servers
 - c. Store and forward methodology where selected data is stored on a local server at the division and later forwarded to a Central Server Data Store.
 - d. Others

WMATA has not defined which type of data store is required for this project. Instead, WMATA desires that the Contractor include (as part of their proposal response) a description of the Back Office Data Store solution that best fits the Contractor's application. If Contractor's solution requires more than a Central Server, Contractor shall include a network diagram clearly indicating the planned quantity, configuration and location of all of the servers.

6.0 Supervisor / Metro Police Vehicle On-Board Subsystem

The Contractor's Bus CCTV system solution shall include all hardware and software to be installed onboard the Supervisor / Police vehicles for the purpose of the following:

- Realtime (or historical) viewing of video/audio/event/metadata from a bus within wireless range
- Upload of selected video from a bus within wireless range.

The WMATA Bus CCTV "Base System" will include 50 Supervisor / Police Vehicles. Contractor's are responsible for the purchase and installation of the laptop hardware and software. WMATA has specified the make/model and configuration of the laptop hardware to be purchased (See Section 5.1 below). Contractor's shall ensure that their software will function on these laptops.

6.1 Laptop Hardware

The Contractor shall provide and install one laptop per Supervisor / Police vehicle. The laptop hardware shall meet the following specifications.

Rugged Laptop	
System Attribute	Attribute Specification
Vendor:	Dell
Name:	Latitude XFR D630
Catalogue Number:	84 W1120
Processor:	Intel Core 2 Duo Processor T7250 (2.00 GHz, 2M, 800MHz, L2)
LCDs:	14.1 inch 500 nit Outdoor-viewable LCD Panel in Black
Memory:	3.0GB, DDR2 SDRAM, 2 DIMMs
Keyboard:	Internal English Keyboard
Graphics:	Intel Integrated Graphics Media Accelerator X3100
Hard Drive:	1300GB Shock Mounted Hard Drive, 8MM, 5400RPM
Floppy Disk Drive:	No Floppy Drive
Bluetooth:	Dell Wireless® 360 Bluetooth Module for Windows XP
Touchpad:	Touchpad with UPEK® Fingerprint Reader
Operating System	Windows Vista Business Downgrade, XP Pro Installed, English
Mouse:	Standard Touchpad
Media:	8X DVD+/-RW w/Roxio and Cyberlink Power DVD
Wireless LAN:	Intel 1490 802.11a/g Dual-Band Mini Card
Batteries:	6 Cell Primary Battery

6.2 Laptop Software

The Supervisor / Police laptop software shall have the same basic capabilities as the MVM software, but shall not allow the Supervisor / Police user to make modifications to the configuration parameters on the Bus CCTV System DVR. Additional capabilities for the Supervisor / Police software include:

- i. The ability to automatically see a list of bus numbers within wireless range of the Police / Supervisor vehicle.
- ii. The ability for the Supervisor / Police user to easily select one of the “in range” buses for immediate viewing of video from that bus.
- iii. The ability for the Supervisor / Police user to download a portion of video from the bus to the local laptop.
- iv. [FUTURE: WMATA is interested in the future capability for the Police / Supervisor to upload video from the Supervisor / Police vehicle laptop to the Back Office Data Store over a commercial wireless link. This capability is not a requirement at this time. However, if Contractors have this capability in their product at this time, they should include the following information in their proposal:
 - a. A brief description of the 3rd party communications backbones supported (e.g., Verizon, AT&T, etc.)
 - b. A brief description of where this capability has been installed and tested (i.e., transit agency, Contractor’s lab, etc.)

6.3 Mobile Wireless

As is indicated in Section 5.1 above, the recommended Supervisor / Police laptop contains a built-in Intel 1490 802.11a/g Dual-Band Mini Wireless Card for 802.11g communication to the WMATA Transit Vehicle. Some Contractor’s solutions may require an additional wireless router onboard the Supervisor / Police vehicle in order to perform the functionality required. If so, it is the responsibility of the Contractor to provide and install any such wireless router hardware/software. Contractors shall state (as part of their proposal) whether the embedded laptop 802.11g card will be sufficient, or if additional wireless router hardware/software will be required.

7.0 Installation and Cable Requirements

This section provides detailed specifications for the installation and cabling standards and requirements that the Contractor shall adhere to on this project.

7.1 Vehicle Installation and Cable Requirements

The WMATA Bus CCTV Onboard equipment shall meet the following installation standards and requirements:

- i. The Contractor shall perform all Transit Vehicle and Supervisor / Police Vehicle equipment and software installation outlined in this SOW unless otherwise noted.
- ii. Three phases of installation are outlined in this RFP. They include the following:
 - a. Pilot Vehicle Installation: The Contractors that make the proposal evaluation short list will be invited to install two (2) Transit Buses and one (1) Metro Police Vehicle with their Bus CCTV System solution, as well as integrate the systems with the WMATA

- WLAN. These Pilot Vehicle installations will be evaluated over a 30 day test period and results will be used as part of the final Contractor selection.
- b. Mini-Fleet Installation: The Mini-Fleet phase will include the installation of twelve (12) Transit Buses and three (3) Supervisor / Metro Police vehicles.
 - c. Fleet Installation: Once the Mini-Fleet phase is complete, the Contractor will be authorized to perform installations on the remainder of the fleet.
- iii. Installation Hours: WMATA will allow the Contractor to perform installations Monday thru Friday between the hours of 9:00 AM and 3:00 PM. WMATA will also consider occasional weekend hours if needed.
 - iv. WMATA will provide 8 buses per day (4 per division for 2 divisions at a time) for installation
 - v. The Contractor is responsible to provide and install all cable, brackets, and other associated materials necessary to complete the installation.
 - vi. It is the responsibility of the Contractor to remove without damage and transfer to WMATA any existing Bus CCTV equipment prior to beginning installation of the new equipment. (NOTE: The Contractor may choose to reuse any existing cable, but shall be responsible to ensure that the cable meets the requirements of this RFP, and shall be responsible for warranty and maintenance of this cable.)
 - vii. All equipment shall be installed so as to allow easy access to the equipment for maintenance purposes.
 - viii. All DVR, hard drive, camera, 802.11 wireless, GPS and G-Force equipment shall be identified by a permanently affixed part number and serial number.
 - ix. Prior to beginning Pilot and Mini-Fleet installations, the Contractor shall be responsible for making recommendations for the location of equipment, and for providing this information in written form to WMATA in accordance with the Documentation (Section 8) of this SOW. WMATA shall have final approval for the placement of all equipment prior to installation.
 - x. Bus CCTV equipment including the DVR, cameras, hard drives, 802.11 wireless, GPS, and optional G-Force shall be removable/replaceable as a single unit. If components such as the wireless and/or G-Force are embedded in the DVR, then they shall be easily replaceable without having to replace the entire DVR.
 - xi. All connectors on back of equipment shall be hidden from the view of all non-authorized personnel.
 - xii. All Bus CCTV equipment (other than cameras, microphone and antennas) shall be contained in a secure lockable cabinet. Some buses have existing lockable cabinets that can be used if there is sufficient space available. For buses without these cabinets, the Contractor shall be responsible for providing the cabinets and keys. All cabinets provided by the Contractor shall be keyed alike.
 - xiii. Contractor supplied cabinets shall be mounted out of the way of the riding public and bus operator.
 - xiv. When performing installations, the Contractor shall take care to avoid damage to both the newly installed and existing wiring and equipment. Any damage to the vehicle, other components on the vehicle, or newly installed equipment shall be the responsibility of the Contractor to correct.
 - xv. Prior to beginning installation of equipment on any bus, the Contractor shall document (in a pre-installation checklist) any significant damage that is pre-existing on that vehicle. Upon completion of the installation, the Contractor shall ensure that the bus is returned in the same condition as it was found prior to installation.

- xvi. Connections shall be made with mechanical connectors specifically designed for heavy-duty automotive applications. All wiring and connectors shall be installed in strict adherence to standard installation practices and to federal, state or local applicable codes. If the Contractor installs wiring or cabling, the Contractor shall be fully responsible for correcting any defective installation and repairing any damage caused by the installation, at no additional cost to WMATA.
- xvii. All Bus CCTV equipment that requires mounting in the bus shall be through-mounted with lock nuts to assure that each piece of equipment is properly secured. No sheet metal screws shall be allowed for equipment mounting and installation.
- xviii. Prior to beginning work, the Contractor shall submit wiring and cabling product information to WMATA for review and approval.
- xix. All wiring shall be multi-strand, flame retardant and made of flexible material.
- xx. All connectors shall have a locking design. If any bare-wire or plug-in connectors are required, they shall be installed with soldered sleeves.
- xxi. No crimp style connectors, T-Taps or butt connectors shall be used.
- xxii. All cable shall be of a single continuous piece, and shall not be spliced together or be the combination of multiple shorter cable lengths.
- xxiii. All wire and insulation shall be sized based on the current carrying capability, voltage drop, mechanical strength, temperature and flexibility requirements.
- xxiv. The cable utilized for power shall be sized appropriately based on the power requirements of the Bus CCTV equipment and power source utilized.
- xxv. All cable shall be appropriately tagged, and be of consistent color coding across all vehicles installed. All cabling documentation provided shall reference the color coding used.
- xxvi. All cable shall be prefabricated into standardized harnesses for connection with components at both ends.
- xxvii. All cable shall be bundled and secured with nylon tie wraps at least every eighteen inches.
- xxviii. Video, audio, wireless and other equipment cable shall be properly shielded to avoid such issues as signal loss and/or interference with other onboard equipment. Particular care shall be given to the placement and cabling associated with the 802.11 wireless and GPS antennas. The Contractor shall be responsible for ensuring there is no interference with other onboard equipment, and for the relocation or additional shielding required if unacceptable interference or signal loss occurs.
- xxix. Cable fastenings, supports, and hangers shall be adequate to support their loads and meet transit usage.
- xxx. Whenever cable is passed through a hole created in a solid surface, the Contractor shall install a protective plastic or rubber grommet to ensure there will not be chaffing or cutting of the wire over time.
- xxxi. Contractors shall include at least an additional 18" service loop at each end of cables
- xxxii. Cables fed through the articulated portion of a bus shall include sufficient length and protection to ensure the safe movement of this cable within that area.
- xxxiii. Contractor shall provide WMATA with at least 3 sets per division of any special tools required for removal/replacement of equipment.
- xxxiv. Contractor shall be responsible for installation, configuration and testing of all initial software and software updates/upgrades/patches on the Transit Buses and Supervisor / Police vehicles.

- xxxv. Contractor responsible for installation of all initial software, as well as software updates/patches required during the warranty or maintenance periods.
- xxxvi. Software updates shall not require the removal of any Bus CCTV equipment.

7.2 Fixed End Installation Requirements

The Contractor shall provide all Back Office installation services to meet the following specifications:

- i. Perform initial software installation on WMATA-designated workstations.
- ii. Perform software configuration at WMATA's direction.
- iii. Perform informal knowledge transfer during the installation to designated WMATA personnel.
- iv. Verify and validate all required software installations and workstation configurations
- v. Perform initial software installation on a WMATA-designated server
- vi. Perform software configuration at WMATA's direction.
- vii. Perform informal knowledge transfer during the installation to designated WMATA personnel.
- viii. Verify and validate all required server software installations and server configurations.

8.0 Schedule

This section provides an overview of the project phases, including the following:

1. Contractor Short-List and Pilot Demonstration Phase resulting in Contractor Award
2. Design Phase
3. Min-Fleet Phase – Including 30 - 45 day functional and reliability test
4. Fleet Installation Phase
5. Final Acceptance Testing Phase to complete no later than December 31, 2009.

8.1 Contractor Short-List and Pilot Demonstration Phase

The Contractors meeting the short list will be invited to install two revenue vehicles and one Metro Police Vehicle with their system, and integrate the mobile systems with the WMATA wireless LAN. Following installation, selected WMATA and WMATA consulting staff will be trained in the operation of the systems.

The WMATA staff will perform thirty (30) days of functional testing of the shortlisted systems. At the end of this phase, Oral interviews will be held with the shortlisted Contractors. Part of these interviews will be feedback from WMATA staff on deficiencies and any other issues identified during the Pilot Demonstration. Contractors will then be asked to provide a best and final offer, including a plan to address each issue/deficiency.

WMATA will award to the Contractor who scores best on a combined Technical and Price evaluation.

8.2 Design Phase

The Design Phase will occur post award to address any of the deficiencies/issues identified in the pilot. This phase will include a Preliminary Design Review and a Final Design Review. Following this effort, Mini-Fleet installation and Testing can begin.

8.3 Mini-Fleet Phase

The Mini-Fleet phase will include the installation of ten (10) Transit Bus Vehicles and two (2) Metro Police vehicles. Once installation is complete and approved by WMATA, a 45 day functional and reliability test will begin.

During this phase, WMATA and WMATA consultant staff will work daily with the system running tests to prove system performance including tagging data and testing uploads, requesting data, viewing data, remote access via Metro Police vehicles, using configuration control and system monitoring applications, etc.

Following completion of this testing, the Contractor shall correct any identified deficiencies/issues prior to fleet installation. WMATA will accept or reject each installation within seventy two (72) hours from the completion of the installation.

8.4 Fleet Installation Phase

Once the Mini-Fleet testing is complete and any deficiencies corrected, the Contractor will be directed to start fleet installation. WMATA anticipates a multi-year contract for fleet installation based on funding availability.

8.5 Final System Acceptance Phase

Once all vehicles are completely installed, a Final System Acceptance Test will be performed that focuses on system wide testing. This system wide testing will include testing of functions such as the wireless download, server storage, etc. Upon successful completion of Final System Acceptance Test, the Warranty phase will begin.

9.0 Documentation

This section provides an overview of the required project documentation. For each type, the following requirements shall apply:

- The Contractor shall provide four (4) copies of documentation and diagrams showing the installation of any fixed-end component and vehicle systems. This documentation shall not be generic, but shall be specific to the work required for WMATA.
- The Contractor shall supply four (4) complete sets of systems operations and maintenance manuals for each type or model of equipment purchased. The manuals will cover all hardware and software.
- All copies provided shall be in hard copy and one set of final as-built documentation for each vehicle type shall be provided by the contractor in “.pdf “ file format.
- WMATA shall review the documentation, diagrams and manuals for completeness and clarity. If WMATA determines additional information is required, the Contractor will supply the requested information to WMATA in the format specified by WMATA.

9.1 Pilot Demonstration Test Plan

Each Contractor will compile a test procedure for their equipment in accordance with the WMATA provided Pilot Demonstration Test Plan. These procedures will provide a script to manually tag data,

access data once uploaded, and use other systems functions for daily testing within the Pilot Demonstration period.

9.2 Project Schedule

The Contractor shall submit an Implementation Plan/Project Schedule documenting their approach and milestones to system installation, integration, testing and acceptance.

The Implementation Plan shall include the Contractor's proposed list and sequence of activities for the delivery of the full system in accordance to the requirements in these specifications, and their associated milestones for testing and acceptance. As a minimum, the Implementation Plan shall include the sequence and duration of the following activities:

- (a) Engineering & Design
- (b) Equipment procurement and pre-delivery testing;
- (c) Equipment shipping and site arrival;
- (d) Central systems installation;
- (e) Onboard systems installations;
- (f) Wireless communications system installation;
- (g) Testing and acceptance tasks and milestones
- (h) Training

9.3 System Design Document

Following detailed engineering and design, the Contractor shall furnish WMATA with complete written documentation describing the system to be delivered including all equipment and software to be furnished. The System Design Documentation shall include the following minimum information:

- Overall system schematic and architecture;
- Communications network diagrams (including Wireless Communications System components) showing the physical and logical architecture;
- Major assumptions and risks;
- Detailed description of all subsystems and equipment and hardware, including functional description, interface descriptions, security provisions, communications loading details, material specifications (i.e. environmental, electrical etc), configuration details and installation details;
- Details on all network, data, power/electrical or other requirements provided by any third party;
- Detailed description of all software, including functional description, system interface descriptions, Graphical User Interface descriptions, hardware specifications, availability and reliability figures and configuration details;
- Detailed descriptions of information, materials and timing required by the Contractor by other parties;
- In depth system installation details and diagrams for each revenue and non-revenue make/model and each different configuration;
- Sub-system Integration Plan;
- Parts list for each piece of equipment supplied. The parts list shall identify the manufacturer(s) and model/part number of all equipment. The Contractor may use manufacturers data sheets or handbooks for individual equipment items that are a subcomponent within the overall system.

As-Built Documentation

The Contractor shall provide sufficient documentation to reflect "as supplied" conditions and to facilitate operation, maintenance, modification and expansion of the equipment or any of its individual components to the satisfaction of WMATA or its representative.

The as-built documentation shall be provided three (3) weeks after Acceptance has been granted for each vehicle type as it occurs, and updated documentation will be required at any time the Contractor provides software or hardware upgrades.

9.4 Vehicle Acceptance Test Procedure

A Vehicle Acceptance Test Procedure (VATP) shall be created to provide a method for testing new installations as well as retesting vehicle systems following any repair or alignment activities. The VATP shall include configuration, setup, and complete test method to provide complete evidence that the installed system is fully functional prior to the system being put into revenue service. VATP's shall be created for the revenue vehicle fleet as well as non-revenue vehicle installations. VATP's shall be performed immediately upon completion of installation of a vehicle.

9.5 Mini-Fleet Test Procedure

The Mini-Fleet Test Procedure shall include daily test routines to be run on each installed vehicle. The procedure should detail setup, functional tests, and expected results. Daily test sheet's shall be a part of this procedure such that proper test documentation can be maintained during the testing period.

9.6 Final System Acceptance Test Procedure

Final System Acceptance Test Procedures shall include testing to be performed upon completion of all vehicle installations and successful VATPs. The Final System Acceptance Test Procedures will contain certain "system-wide" testing not covered by the VATPs, to include such items as:

- System wireless upload testing
- System database storage and retrieval testing

9.7 Software User's Manual

A User Manual shall be provided for each software application. The User Manual shall include screen captures and easy to follow instructions to assist the users through all of the tasks that they may need to complete. The User Manual shall include an index. As a minimum, the User Manual shall include all information that is available through the context sensitive help. Fault procedures shall be described, as well as procedures for dealing with problems.

A System Administrator Manual shall be provided for each software application. The System Administration Manual shall outline all of the installation procedures, configuration parameters, details on how to configure the parameters, back up and recovery process, trouble shooting techniques and technical support information. Fault procedures shall be described, as well as procedures for dealing with problems.

9.8 Hardware and Software Maintenance Manual

The operation and maintenance documentation will be comprised of the Operation and Maintenance (O&M) manuals and the User Manuals and System Administration Manuals as described above. The O&M documentation shall be submitted to WMATA prior to Mini-Fleet Testing. The Contractor shall deliver complete sets of O&M manuals as defined in the Pricing Schedules; (1) complete, electronic version of each manual shall also be provided.

The O&M manuals shall be a detailed presentation of all onboard systems and shall include illustrations where applicable. For each onboard unit, it shall include, but shall not be limited to:

- General description;
- Functional descriptions;
- Functional block diagram;
- Operating instructions;
- Maintenance and repair procedures;
- Test procedures;
- Schematic drawings and circuit diagrams;
- and Parts list.

Each type of maintenance manual shall contain but not be limited to:

- Description of operation including start-up, shut-down and emergency procedures;
- Installation procedures;
- Complete parts identification diagram and list;
- Troubleshooting procedures;
- Inspection procedures;
- Preventive maintenance procedures and program;
- Repair procedures;
- Diagnostic procedures;
- Wiring diagrams;
- Electrical schematics with board and cable identification;
- Adjustment procedures;
- Seasonal maintenance requirements;
- Equipment arrangement and drawings;
- Names and schedules of all lubricants and cleaners used; and
- Other consumable materials for the equipment stating where used, quantity, service intervals and annual consumption.

The Contractor shall provide a parts list for all equipment supplied. The parts list shall identify the manufacturer(s) and model/part number. The Contractor may use manufacturer's data and handbooks for individual items of the equipment that are a sub-component of the overall system. All such documentation shall be contained in similar binders. Where an equipment component is of such a nature that local repairs cannot be made and it must be returned to the factory as a unit for overhaul, specific information concerning its repair and breakdown into component parts shall be provided.

10.0 Training

This section provides an overview of the required project training, including the following:

10.1 General Training Requirements

The Contractor shall fulfill the following general training requirements:

- i. The Contractor shall be responsible for operation and maintenance training of WMATA designated personnel on all hardware and software provided as part of the Bus CCTV project.
 - ii. The Contractor shall perform all training at WMATA facilities located in Landover, Maryland.
 - iii. The Contractor shall perform all training as a combination of classroom and hands-on training.
 - iv. The Contractor shall only utilize experienced and qualified personnel for training courses. Personnel shall have had prior experience of performing these same training classes for other similar transit agency systems.
 - v. The Contractor is responsible for providing all training materials, visual aids, projects, sample equipment, etc.
 - vi. One complete set of hardcopy training materials will be provided to each WMATA student. Also, one electronic set of material shall be provided to WMATA with rights to make copies.
 - vii. All training materials are to become the property of WMATA.
 - viii. Training classes shall be scheduled for the following periods of the contract:
 - a. One complete suite of classes to be performed during the mini-fleet installation phase.
 - b. One follow-up suite of classes to be performed at the completion of fleet installation, just prior to final acceptance.
- For each training class listed below (Sections 9.2 – 9.5) the Contractor shall provide the number of sessions called out for each “suite” of classes.
- ix. A training plan shall be submitted to WMATA prior to the first suite of training classes. The training plan shall contain an overview and outline of the agenda for the training class as well as the outcomes that are to be learned. WMATA shall review, comment and provide final approval on the training plans.

10.2 Hardware Maintenance Training

The Contractor shall provide hardware maintenance training for all equipment provided as part of this project. Requirements include the following:

- i. Two sessions per suite of classes shall be held for maintenance technicians (one day, one night).
- ii. Training shall include hands-on experience in the following activities:
 - a. Preventive Maintenance (PM) techniques
 - b. Remove and replace techniques for all major components on the Transit Bus and Supervisor / Police vehicle
 - c. Equipment testing and diagnostic techniques
 - d. Understanding “Health Check” reports and email status
 - e. Reporting maintenance issues to local Contractor Warranty and Maintenance support personnel.

- iii. Although WMATA shall be trained by the Contractor on these Hardware Maintenance techniques, it shall be the responsibility of the Contractor to actually perform hardware maintenance during the Warranty and Maintenance periods.

10.3 Software Maintenance Training

The Contractor shall provide software maintenance training for all software provided as part of this project. Requirements include the following:

- i. One session per suite of classes shall be held.
- ii. Training shall include hands-on experience in the following activities:
 - a. Implementation of application software passwords and privileges.
 - b. Software and data backup and restore.
 - c. Installation of software/firmware patches, updates and upgrades for Transit Bus, Supervisor / Police Vehicle, and Back Office portions of Bus CCTV System.
 - d. Understanding “Health Check” reports and email status
 - e. Reporting software maintenance issues to local Contractor Warranty and Maintenance support personnel.
- iii. Although WMATA shall be trained by the Contractor on these Software Maintenance techniques, it shall be the responsibility of the Contractor to actually perform hardware maintenance during the Warranty and Maintenance periods.

10.4 Application Software Administrator’s Training

The Contractor shall provide application software administrators training for all application software provided as part of this project. Requirements include the following:

- i. One session per suite of classes shall be held.
- ii. Training shall include hands-on experience in the following activities:
 - a. How to setup and modify DVR configuration parameters using MVM software
 - b. How to download DVR configuration parameters to one or more buses using MVM software.
 - c. How to setup and modify MVWM wireless configuration parameters including “Health Check” and “Requested Video”.
 - d. Implementation of application software passwords and privileges.

10.5 Video Review User’s Training

The Contractor shall provide video review user’s training for all video review software provided as part of this project. Requirements include the following:

- i. One session per suite of classes shall be held. This training will be done in the format of “Train the Trainer”, whereby the Contractor shall train designated WMATA trainers, who in turn will train all of the individuals that will be performing the Video Review function.
- ii. Training shall include hands-on experience in the following activities:
 - a. Video review using MVM software.
 - b. Video export capabilities using MVM software.
 - c. Video image print capabilities using MVM software
 - d. How to setup for video review in each of the following situations:

- i. Direct connect to DVR on Transit Vehicle
- ii. Live video review over 802.11 wireless from division workstation / laptop
- iii. Video review from removable hard drive mounted in attached docking station.
- iv. Video review from Supervisor / Police vehicles.

11.0 Warranty and Maintenance Support

General: The rights and remedies of WMATA under this Part are not intended to be exclusive and shall not preclude the exercise of any other rights or remedies provided for in this specification, or by any subsequent contract, or by law or otherwise.

Warranty: The Contractor shall warrant that all goods supplied, systems, equipment, designs, and work covered by this Scope of Work and subsequent contract shall be satisfactory for its intended purpose, shall conform to and perform as called for in the Contract requirements specifications and shall be free from all defects and faulty materials and workmanship. Any goods supplied, systems, equipment, designs, or work found to be defective within the time specified below shall be repaired, remedied, or replaced, hereinafter called “corrective work”, by the Contractor, free of all charges including transportation.

- i. The warranty period for all Contractor-provided Part 1 Base System goods, systems, and equipment supplied, except spare parts, shall extend to thirty six (36) months after Final Acceptance of all Part 1 Base System installations. It is projected that all Part 1 Base System installations will be completed and accepted within four (4) months from the date of contract award, however, the start date warranties for all accepted installations shall not exceed six (6) months from the date of contract award.. WMATA will accept or reject each installation within seventy two (72) hours from the completion of the installation.
- ii. The warranty period for spare parts shall extend for thirty six (36) months from the placement of each spare part into regular service.
- iii. The Contractor shall provide the formal signed warranty(s) no later than ten (10) days after each equipment installation is accepted.
- iv. Replacement parts and repairs provided, pursuant to corrective work hereunder, shall be subject to prior approval by WMATA and shall be tendered and performed in the same manner and extent as items originally delivered in accordance with this SOW.

Maintenance Agreement: The Contractor’s proposal for the Bus CCTV system solution shall include a Maintenance Agreement for all hardware and software provided by this SOW. The Contractor shall provide written maintenance agreement subject to WMATA approval and must include the following terms and conditions:

- i. Terms of the maintenance agreements shall begin for all Contractor-provided goods supplied, systems, equipment, designs, and work covered by this Scope of Work following acceptance of each Bus CCTV system.
- ii. Provide all labor, tools, parts and materials necessary to maintain in proper working order all provided goods supplied, systems, equipment, designs, and work provided by this Scope of Work for its intended purpose. This shall include labor and tools during the Warranty period.

- iii. Provide seventy-two (72) hour corrective action response time, from notice to completion of repairs, to restore all Contractor-provided goods supplied, systems, equipment, designs, and work covered by this Scope of Work.
- iv. Provide liquidated damages to WMATA as consideration for the failure of Contractor to provide the seventy-two (72) hours corrective action response. Liquidated damages shall be the cost for WMATA to perform the corrective action themselves. This shall be calculated by taking the [number of hours to perform the repair] * [the prevailing hourly wage + WMATA's overhead rate].
- v. Fully exercise all warranty provisions afforded by this Scope of Work for the benefit of WMATA.
- vi. Provide coordination of Contractor supplier to maintain in proper working order all provided goods supplied, systems, equipment, designs, and work provided by this Scope of Work for its intended purpose, shall conform to and perform as called for any necessary updates and corrective actions necessary to ensure current up-to-date revisions and service bulletins from component Contractors.
- vii. Comply with all WMATA work standards, rules, and regulations while on WMATA property including any FTA Substance testing requirements.
- viii. Replacement parts and repairs provided, pursuant to corrective work hereunder, shall be subject to prior approval by WMATA and shall be tendered and performed in the same manner and extent as items originally delivered in accordance with this SOW.
- ix. Provide formal report of corrective action suitable for complete entry in the MAXIMO maintenance reporting, or any other format subject to approval by WMATA
- x. Provide off-site storage tools, parts, and materials.
- xi. Cooperate with WMATA and subsequent Contractor in good faith effort in the event of maintenance contract termination and provide full cooperation during transition to subsequent maintenance provider including corrective action response requirements.